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IS 6497 (1990): Method of test for the efficacy of preservatives and evaluating the natural durability of timbers used in cooling towers [CED 9: Timber and Timber Stores]



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“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

**METHOD OF TEST FOR THE EFFICACY OF
PRESERVATIVES AND EVALUATING THE
NATURAL DURABILITY OF TIMBERS
USED IN COOLING TOWERS**

(First Revision)

भारतीय मानक

**प्रशोतन टावरों में प्रयुक्त लकड़ी के स्वाभाविक टिकाऊपन के मूल्यांकन और
परिरक्षक की क्षमता के परीक्षण की पद्धति
(पहला पुनरीक्षण)**

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 19 March 1990, after the draft finalized by the Timber Sectional Committee had been approved by the Civil Engineering Division Council.

The specification for timber for cooling towers together with details of preservatives used for such timber have been covered in IS 2372 : 1963 'Timber for cooling towers'. This standard covers the methods of testing the efficacy of preservatives used for the timber for cooling towers.

This standard was first published in 1972 and a revision has been considered necessary to incorporate changes in the manner of mounting wooden samples for tests. In this revision, brass nails are therefore recommended for mounting the wooden samples instead of threads. The figures for thin specimen and arrangement for testing in wooden frame have been modified accordingly.

In the preparation of this standard, considerable assistance has been rendered by Forest Research Institute, Dehra Dun. Also due weightage has been given to international coordination among the standards and practices prevailing in different countries in addition to relating it to the practices being followed in this country.

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (revised)'.

Indian Standard

METHOD OF TEST FOR THE EFFICACY OF PRESERVATIVES AND EVALUATING THE NATURAL DURABILITY OF TIMBERS USED IN COOLING TOWERS

(First Revision)

1 SCOPE

1.1 This standard covers the method for determining the efficacy of preservatives and evaluating the natural durability of timber used in cooling towers where heavy deposits due to circulating water do not occur.

2 REFERENCES

2.1 The following Indian Standards are necessary adjuncts to this standard:

IS No.	Title
401 : 1982	Code of practice for preservation of timber (<i>third revision</i>)
2372 : 1963	Specification for timber for cooling towers

3 PRINCIPLES

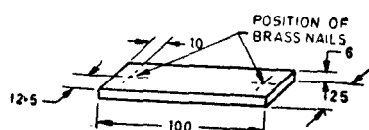
3.1 The efficacy of preservatives and the natural durability of timber in cooling towers are evaluated on the basis of deterioration in specimens as determined by weight loss method in case of thin specimens, and rating method in case of stakes. The size and shape of thin specimens have been so chosen as to ensure a large surface to volume ratio which accelerates the depletion of preservatives from timber.

4 EFFICACY OF PRESERVATIVES

4.1 Size and Selection of Specimens

The specimens shall be of timber conforming to IS 2372 : 1963 and of sizes as under :

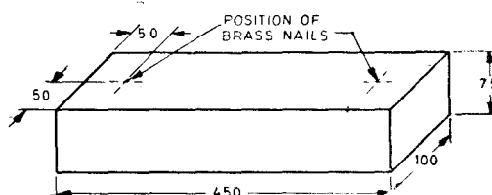
- a) Thin specimen size 100 mm × 25 mm × 6 mm with two holes having dia of 2 mm (see Fig. 1) for installation in flooded and extremely moist areas of the tower.



All dimensions in millimetres.

FIG. 1 DETAILS OF THIN SPECIMEN

- b) Stake size 450 mm × 100 mm × 75 mm with two holes having dia of 4 mm (see Fig. 2) for installation in regions subjected to alternate drying and wetting or on the structural members of the towers.



All dimensions in millimetres.

FIG. 2 DETAILS OF STAKE

4.1.1 The specimens after careful preparation shall be screened and defective ones rejected.

4.2 Numbering of Specimens

The specimens shall then be numbered as follows:

- a) The numbers will be stamped on the left end of the specimens on both sides.
- b) The first figure will indicate the species, the second will indicate the treatment/preservative and the third will bear the serial number.

4.3 Treatment

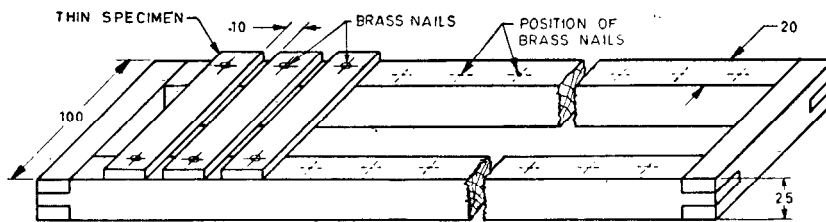
The treatment shall be carried out according to IS 401 : 1982.

4.3.1 For testing efficacy of preservatives not included in IS 2372 : 1963 the treatment shall be carried out at three levels of absorption and copper-chrome-arsenic composition shall be used as a reference preservative.

4.4 Replicates

4.4.1 Thin Specimens

Replicas 18 in number of each species and for each absorption level with 18 control specimens shall be obtained for each cooling tower. One treated specimen of each absorption level of each species along with one control shall be fixed on a wooden frame (see Fig. 3). *Chir Pinus Roxburghii Sargent*) shall be used as a reference species.



All dimensions in millimetres.

FIG. 3 ARRANGEMENT OF SPECIMENS FOR TESTING IN WOODEN FRAME

4.4.2 For stakes 4 replicas of each species with each preservative along with four controls shall be obtained for each cooling tower. Two replicas of each species and treatment and two controls will form one set.

4.5 Installation

4.5.1 Frames (Containing Thin Specimens)

The frames shall be installed both in the flooded area and also in the extremely moist regions of the tower. Nine frames shall be installed in the fill area, or on the lower inside casing; another nine frames shall be fixed on the upper inside casing or the lower drift eliminators.

4.5.2 Stakes

One set of stakes shall be fixed in the moist, non-flooded portion of the tower on structural members. The other set shall be installed in the wet part of the tower on structural members like lower part of the tower above water tank.

4.6 Inspection

4.6.1 The installed specimens in the towers shall be examined after 1, 3 and 5 years of installation. The period of third inspection may be changed depending upon the conditions of the specimens. In case of thin specimens three frames each from the flooded and moist area of the tower shall be removed in each inspection for evaluating the deterioration.

4.6.2 Stakes shall be examined visually after removing from the site in the cooling tower. Their conditions shall be recorded and the specimens shall then be fixed in their original position as carefully as possible without disturbing the adjacent surroundings. The observations shall be recorded as follows:

- Visual** — The appearance of the timber shall be recorded; the depth to which loose material could be scraped with a blunt object shall also be noted down.
- Touch** — Whether the surface is smooth, fibrous or crumbly.
- Strength** — The softening of the surface and the depth of the penetration of a sharp pointed probe shall be noted down as an indication of strength.

4.7 Evaluating the Deterioration

4.7.1 The deterioration in case of thin specimens shall be evaluated on the basis of weight loss, while in case of stakes it shall be based on rating method.

4.7.2 Thin Specimens

The specimens after removal from the cooling towers shall be correctly identified and tagged. The specimens shall then be carefully cleaned in tap water and if necessary very dilute solution say 0.05 percent of HCl to remove the calcareous deposits from sample and dried in an oven maintained at 100 to 105°C at a constant weight. For calculating the actual weight loss due to deterioration in cooling towers, an adjustment value factor (for the loss due to leaching of the preservatives/extractives or due to exudation of preservative when the specimens treated with oil containing preservatives are subjected to oven drying) will have to be brought into calculations.

4.7.3 In case of specimens treated with oil soluble preservatives these shall be kept in separate weighed beakers and oven dried so that the preservative that oozes out may be correctly accounted for. The factor is calculated as a percentage weight loss from a set of treated specimens (consisting of 10 specimens representing the whole range of treatment, that is, ± 10 percent of the actual required absorption), which are tied in the form of a bundle with crossers in between each specimen so as to provide free surface and are submerged in fresh water at 45 to 50°C for a period of 1 week, after which the specimens are dried for 2 weeks in air. These are then again subjected to the same leaching and drying cycle for a total period of 18 weeks. The average percentage weight loss of these samples is the adjustment value. On the basis of this value the weight loss from each specimen removed from the cooling tower is calculated.

4.7.4 Calculation of Adjustment Value

The adjustment value is calculated as follows:

The total weight of specimen on dry weight basis = $a + b$

Chemical leached out = $(a + b) - c$

Leached out percentage = $\frac{(a + b) - c}{a + b} \times 100$

where

a = oven-dry weight of the specimens (before treatment),

b = net retention of preservative in the specimen (dry salt), and

c = oven-dry weight of the treated specimens after leaching in tap water for 18 weeks.

The average value of ten specimens shall be the adjustment value.

4.7.5 Stakes

The stakes shall be examined visually and their conditions recorded as stated in 4.6.2. A grading system shall be adopted for recording the amount of material or percentage strength destroyed by a particular type of attack. This may be represented by giving '1' for the beginning of the

attack and '5' for the complete destruction of the specimen, a grading of '4' may indicate that the useful life of the piece is over.

5 NATURAL DURABILITY

5.1 For evaluation of the natural durability of timbers the specimens shall be prepared from heartwood in sizes mentioned in 4.1. The number of replicas for each cooling tower in case of this specimen and stakes shall also be 18 and 4 respectively. The period of inspection shall be 1, 3 and 5 years after installation. In case the specimens show rapid deterioration the period may be changed to 1, 2 and 3 years.

5.1.1 The deterioration shall be evaluated as in the case of efficacy of preservatives for the thin specimens and stakes, that is, on weight loss method and rating method respectively.

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